moon, the Moon at C, the Earth at c, *Mars* will be seen at ♈,
its true place, as if the Earth were at T. But then, after the Full,
the Moon at D, the Earth at d ; *Mars* will be seen, not at γ, but
at ♓; too forward: and yet more, when the Moon (at the laſt
Quarter) is at E, the Earth at e, and *Mars* seen at ♒. If there-
fore *Mars* (when in oppoſition to the Sun) be found (all other
allowances being made) ſomewhat too backward before the
Full moon, and ſomewhat too forward after the Full-moon,
(and moſt of all, at the Quadratures:) it will be the beſt con-
firmation of the Hypotheſis. (The like may be fitted to *Mars*
in other poſitions, *mutatis mutandis* ; and ſo for the other Pla-
nets.)

But this proof, is of like nature as that of the Parallaxis of
the Earths Annual Orb to prove the Copernican Hypotheſis.
If it can be obſerved, it proves the Affirmative ; but if it cannot
be obſerved, it doth not convince the Negative, but only proves
that the Semidiameter of the Earths Epicycle is ſo ſmall as not
to make any diſcernable Parallax. And indeed, I doubt, that
will be the iſſue. For the Semidiameter of this Epicycle, being
little more than the Semidiameter of the Earth it ſelf, or about
$1\frac{1}{2}$ thereof (as is conjectured, in the *Hypotheſis*, from the Mag-
nitudes and Diſtances of the Earth and Moon compared;) and
there having not as yet been obſerved any diſcernable *Parallax*
of *Mars*, even in his neereſt poſition to the Earth ; it is very
ſuſpicious, that here it may prove ſo too. And whether any of
the other Planets will be more favourable in this point, I can-
not ſay.

ANIMADVERSIONS

Of Dr. Wallis, *upon Mr.* Hobs's *late Book*, De Principiis &
Ratiocinatione Geometrarum.

Theſe were communicated by way of Letter, written in *Ox-
ford*, July 24. 1666. to an Acquaintance of the *Author*, as fol-
lows :

SInce I ſaw you laſt, I have read over Mr. *Hobs*'s Book *Contra
Geometras* (or *De Principiis & Ratiocinatione Geometrarum*) which
you then ſhewed me. A *New* Book of *Old* matter : Containing
but a *Repetition* of what he had before told us, more than once ;
and which hath been Anſwered long agoe.

In which, though there be Faults enough to offer ample mat-

ter

ter for a large Confutation : yet I am fcarce inclined to be-
lieve, that any will beftow fo much pains upon it. For, if that
be true, which (in his *Preface*) he faith of himfelf , *Aut folus in-
fanio Ego, aut folus non infanio :* it would either be *Needlefs*, or *to
no Purpofe.* For, by his own confeffion, *All others*, if they be not
mad themfelves, ought to think *Him* fo : And therefore, as to
Them, a Confutation would be *needlefs* ; who , its like, are well
enough fatisfied already : at leaft out of danger of being fedu-
ced.   And, as to himfelf, it would be *to no purpofe.* For, if *He* be
the Mad man, it is not to be hoped that he will be convinced by
Reafon : Or, if *All We* be fo ; we are in no capacity to attempt it.

But there is yet another Reafon, why I think it not to need
a Confutation. Becaufe what is in it, hath been fufficiently con-
futed already ; (and, fo Effectually ; as that he profeffeth him-
felf not to Hope, that *This Age* is like to give fentence for him ;
what ever *Nondum imbuta Pofteritas* may do.)   Nor doth there
appear any Reafon, why he fhould again Repeat it , unlefs he
can hope, That, what was at firft Falfe, may by oft Repeating,
become True.

I fhall therefore, inftead of a large Anfwer, onely give you a
brief Account, *what is in it*; &, *where it hath been already Anfwered.*

The chief of what he hath to fay , in his firft 10 Chapters, a-
gainft *Euclids* Definitions, amounts but to this, That he thinks,
Euclide ought to have allowed his *Point* fome *Bignefs* ; his *Line*,
fome *Breadth* ; and his *Surface,* fome *Thicknefs.*

But where in his *Dialogues*, pag. 151, 152. he folemnly under-
takes to Demonftrate it ; (for it is there, his 41th *Propofition:*) his
Demonftration amounts to no more but this ; That , *unlefs a
Line be allowed fome Latitude ; it is not poffible that his Quadratures
can be True.*   For finding himfelf reduced to thefe inconveni-
ences ; 1. That his *Geometrical Conftructions* , would not confift
with *Arithmetical calculations*, nor with what *Archimedes* and
others have long fince demonftrated : 2. That the *Arch*
of a Circle muft be allowed to be fometimes *Shorter* than
its *Chord*, and fometimes *longer* than its *Tangent:* 3. That the
fame Straight Line muft be allowed , at one place onely to
Touch, and at another place to *Cut* the fame Circle : (with others
of like nature ;) He findes it neceffary , that thefe things may
not feem Abfurd, to allow his *Lines* fome *Breadth*, (that fo, as he
fpeaks , *While a Sraight Line with its Out-fide doth at one place*
Touch

Touch the Circle, it may with its In-ſide at another place Cut it, &c.)
But I ſhould ſooner take this to be a *Confutation of His Quadra-*
tures, than a *Demonſtration of theBreadth of a*(Mathematical) *Line.*
Of which, ſee my *Hobbius Heauton-timorumenus,* from *pag.* 114.
to *p.* 119.

And what he now Adds, being to this purpoſe ; That though
Euclid's Σημεῖον, which we tranſlate, *a Point ,* be not indeed *No-*
men Quanti; yet cannot this be actually repreſented by any thing,
but what will have ſome Magnitude ; nor can *a Painter,* no not
Apelles himſelf, draw a *Line* ſo ſmall, but that it will have ſome
Breadth ; nor can *Thread* be ſpun ſo Fine, but that it will have
ſome Bigneſs ; (*pag.*2,3,19,21.)is nothing to the Buſineſs ; For
Euclide doth not ſpeak either of ſuch *Points,* or of ſuch *Lines.*

He ſhould rather have conſidered of his own Expediene.
pag. 11. That, when one of his (*broad*) Lines, paſſing through
one of his(*great*) Points, is ſuppoſed to cut another Line propo-
ſed, into two equal parts ; we are to underſtand, the *Middle of*
the breadth of that Line,paſſing through the *middle* of that Point,
to diſtinguiſh the Line given into two equal parts. And he
ſhould then have conſidered further, that *Euclide ,* by a *Line,*
means no more than what Mr. *Hobs* would call *the middle of the*
breadth of his ; and *Euclide's Point,*is but the *Middle* of Mr.*Hobs's.*
And then, for the ſame reaſon, that Mr. *Hobs's Middle* muſt be
ſaid to have no *Magnitude* ; (For elſe,not the *whole Middle,* but
the *Middle of the Middle,*will be *in the Middle:* And,the *Whole* will
not be equal to its *Two Halves* ; but Bigger than *Both,*by ſo much
as the *Middle* comes to :) *Euclide's Lines* muſt as well be ſaid to
have no Breadth ; and his *Points* no Bigneſs.

In like manner, When *Euclide* and others do make the *Terme*
or *End* of a Line, a *Point :* If this *Point* have *Parts* or *Greatneſs,*
then not the *Point ,* but the *Outer-Half* of this Point ends the
Line, (for, that the *Inner-Half* of that Point is not at the End, is
manifeſt,becauſe the *Outer-Half* is beyond it.) And again, if that
Outer Half have *Parts* alſo ; not this,but the *Outer* part of it,and
again the *Outer part* of that *Outer part,* (and ſo in *infinitum.*) So
that, as long as *Any thing of Line* remains, we are not yet at the
End : And conſequently,if we muſt have paſſed the *whole Length,*
before we be at the *End* ; then that *End* (or *Punctum terminans*)
has *nothing of Length* ; (for,when the *whole Length* is paſt, there is
nothing of it left. And if Mr. *Hobs* tells us (as *pag.* 3.) that this
<div align="right">*End*</div>

End is not *Punctum*, but only *Signum* (which he does allow *non esse nomen Quanti*)even *this* will serve our turn well enough. *Euclid*'s Σημεῖον, which some Interpreters render by *Signum*, others have thought fit (with *Tully*) to call *Punctum*: But if Mr. *Hobs* like not that name, we will not contend about it. Let it be *Punctum*, or let it be *Signum* (or,if he please,he may call it *Vexillum*.) But then he is to remember, that this is only a Controversie in *Grammar*,not in *Mathematicks*: And his Book should have been intituled *Contra Grammaticos*,not,*Contra Geometras*. Nor is it *Euclide*, but *Cicero*, that is concern'd, in rendring the Greek Σημεῖον, by the Latine *Punctum*, not by Mr. *Hobs's Signum.* The Mathematician is equally content with either word.

What he saith here, *Chap.8.& 19.* (and in his fifth *Dial.p.105. &c.*)concerning the *Angle of Contact*;amounts but to thus much, That,by the *Angle of Contact*, he doth not mean either what *Euclide* calls an *Angle*,or any thing of that kind;(and therefore says nothing to the purpose of what was in controversie between *Clavius* and *Peletarius*, when he says, that *An Angle of Contact hath some magnitude*:)But,that by the *Angle of Contact*, he understands the *Crookedness of the Arch*; and in saying,*the Angle of Contact hath some magnitude*,his meaning is, that the *Arch of a Circle hath some crookedness*, or, is a *crooked line*: and that, of equal Arches,That is the more crooked,whose chord is shortest : which I think none will deny;(for who ever doubted,but that *a circular Arch is crooked?*or,that,of such Arches,equal in length,*That is the more crooked, whose ends by bowing are brought nearest together ?*) But, why the *Crookedness of an Arch*,should be called an*Angle of Contact*;I know no other reason, but, becaufe Mr. *Hobs* loves to call that *Chalk*, which others call *Cheese*. Of this see my *Hobbius Heauton-timorumenus*,from *pag. 88.* to *p. 100.*

What he saith here of *Rations* or *Proportions*,and their *Calculus*; for 8. Chapters together, (*Chap. 11. &c,*) is but the same for substance, what he had formerly said in his 4th. Dialogue, and elsewhere. To which you may see a full Answer,in my *Hobbius Heauton-tim.* from *pag 49.* to *p. 88.* which I need not here repeat.

Onely (as a *Specimen* of Mr. *Hobs's* Candour , in Falsifications) you may by the way observe,how he deals with a Demonstration of Mr. *Rook's*, in confutation of Mr.*Hobs's* Duplication of the Cube : Which when he had repeated , *pag. 43.* He doth then (that it might seem absurd) change those words, *æquales quatuor*

quatuor cubis DV ; (*pag.* 43. *line* 33.) into thefe (*p.* 44. *l.* 5.) *æqualia quatuor Lineis, nempe quadruplus Rectæ* DV: And would thence perfwade you, that Mr. *Rook* had affigned a *Solide*, equal to a *Line*. But Mr. *Rook's* Demonftration was clear enough for Mr. *Hobfe's* Comment. Nor do I know any Mathematician (unlefs you take Mr. *Hobs* to be one) who thinks that *a Line multiplyed by a Number will make a Square*; (what ever *Mr. Hobs* is pleafed to teach us.) But, That *a Number multiplyed by a Number, may make a Square Number*; and, That *a Line drawn into a Line may make a fquare Figure, Mr. Hobs* (if he were, what he would be thought to be) might have known before now. Or, (if he had not before known it) he might have learned, (by what I fhew him upon a like occafion, in my *Hib. Heaut. pag.* 142. 143. 144.) How to underftand that Language, without an Abfurdity.

Juft in the fame manner he doth, in the next page, deal with *Clavius*. For having given us his words, *pag.* 45 l. 2. 4. *Dico hanc Lineam Perpendicularem extra circulum cadere* (becaufe neither *intra Circulum*, nor *in Peripheria*;) He doth, when he would fhew an errour, firft make one, by falfifying his words, *line* 15. where inftead of *Lineam Perpendicularem*, he fubftitutes *Punctum A.* As if *Euclide* or *Clavius* had denyed the *Point A.* (the utmoft point of the *Radius*,) to be in the Circumference: Or, as if Mr. *Hobs*, by proving the *Point A*, to be in the Circumference, had thereby proved, that the *Perpendicular Tangent A E* had alfo lyen in the Circumference of the Circle. But this is a Trade, which Mr. *Hobs* doth drive fo often, as if he were as well faulty in his *Morals*, as in his *Mathematicks*.

The *Quadrature of a Circle*, which here he gives us, *Chap.* 20. 21. 23. is one of thofe *Twelve* of his, which in my *Hobbius Heauton-timorumenus* (from *pag.* 104. to *pag* 119) are already confuted: And is the *Ninth* in order (as I there rank them) which is particularly confidered, *pag.* 106. 107. 108. I call it *One*, becaufe he takes it fo to be; though it might as well be called *Two.* For, as there, fo here, it confifteth of *Two branches*, which are Both Falfe; and each overthrow the other. For if the *Arch of a Quadrant* be equal to the *Aggregate of the Semidiameter and of the Tangent of* 30. *Degrees*, (as he would *Here* have it, in *Chap.* 20. and, *There*, in the clofe of *Prop.* 27;) Then is it not equal to *that Line, whofe Square is equal to Ten fquares of the Semiradius*, (as, *There*, he would have it, in *Prop.* 28. and, *Here*, in *Chap.* 23.) And if it be equal to *This*, then not to *That.* For *This*, and *That* are not equal: As I then demonftrated; and need not now repeat it.

The grand Fault of his Demonftration (*Chap.* 30.) wherewith he would now New-vamp his old Falfe quadrature; lyes in thofe words *Page* 49. *line* 30, 31. *Quod Impoffibile eft nifi* ba *tranfeat per* c. which is no impoffibility at all. For though he firft bid us *draw the Line R c*, and afterwards the *Line R d*: Yet, Becaufe he hath no where proved (nor is it true) that *thefe two are the fame Line*; (that is, that the point *d* lyes in the *Line R c*, or that *R c* paffeth through *d*:) His proving that *R d cuts off from* ab *a Line equal to the Line of B c*, doth not prove, that *ab* paffeth through *c*: For this it may well do, though *ab* lye *under* c. (vid. in cafe *d* lye beyond the line *R c*, that is, further from *A*:) or though it lye *above* c, (vid. in cafe *d* be nearer, than *R c*, to the point *A.*) And therefore, unlefs he firft prove (which he cannot do) that *A d* (a fixth part of *A D*) doth juft reach to the line *R a* and no further; he onely proves that

that a fixth part of *ab* is *equal* to the Line of *B c*. But, whether it lye *above it*, or *below it*, or (as Mr. *Hobs* would have it) juſt *upon it* ; this argument doth not conclude. (And therefore *Hugenius's* aſſertion, which Mr. *Hobs, Chap.* 21. would have give way to this Demonſtration, doth, notwithſtanding this, remain ſafe enough.)

His demonſtration of *Chap* 23. (where he would prove, that *the aggregate of the Radius and of the Tangent of* 3C. *Degrees* is equal to *a Line, whoſe ſquare is equal to* 10 *Squares of the Semiradius* ;) is confuted not only by me, (in the place forecited, where this is proved to be impoſſible ;) but by himſelf alſo, in this ſame Chap. *pag.* 59 (where he proves ſufficiently and doth confeſſe, that this demonſtration, and the 47. *Prop.* of the firſt of *Euclide*, cannot be both true.) But, (which is worſt of all ;) whether *Euclid's* Propoſition be Falſe or True, his demonſtration muſt needs be Falſe. For he is in this Dilemma: If that Propoſition be *True*, his demonſtration is *Falſe*, for he grants that they cannot be both True, *page* 59 *line* 21. 22. And again, if that Propoſition be Falſe, his Demonſtration is ſo too ; for *This* depends upon *That, page* 55. *line* 22 and therefore muſt fall with it.

But the Fault is obvious in *His Demonſtration* (not in *Euclid's Propoſition:*) The grand Fault of it (though there are more) lyes in thoſe words, *page* 56. *line* 26. *Erit ergo M O minus quam M R.* Where, inſtead of *minus*, he ſhould have ſaid *majus*. And when he hath mended that Error ; he will find, that the *major* in *page* 56. *line penult*, will very well agree with *majorem* in *page* 57. *line* 1 (where the *Printer* hath already mended the Fault to his hand) and then the *Falſum ergo* will vaniſh.

His Section of an Angle *in ratione data* ; *Chap.* 22. hath no other founda-tion, than his ſuppoſed *Quadrature* of *Chap.* 20. And therefore, that being falſe ; this muſt fall with it. It is juſt the ſame with that of his 6. Dialogue. *Prop.* 46. which (beſides that it wants a foundation) how abſurd it is, I have already ſhewed ; in my *Hobbius Heauton timor. page* 119. 120.

His *Appendix*, wherein he undertakes to ſhew a Method of finding *any number of mean Proportionals, between two Lines given :* Depends upon the ſuppoſed Truth of his 22. Chapter ; about *Dividing an Arch in any proportion given :* (As himſelf profeſſeth : and as is evident by the Conſtruction ; which ſuppoſeth ſuch a Section.) And therefore, that failing, this falls with it.

And yet this is otherwiſe faulty, though *that* ſhould be ſuppoſed True. For, In the firſt Demonſtration ; *page* 67. *line* 12. *Producta L f incidet in I* ; is not proved ; nor doth it follow from his *Quoniam igitur.*

In the ſecond Demonſtration ; *page* 68. *line* 34 35. *Recta L f incidit in x* ; is not proved ; nor doth it follow from his *Quare.*

In his third Demonſtration ; *page* 71: *line* 7. *Producta Y P tranſibit per M* ; is ſaid *gratis* ; nor is any proof offered for it. And ſo this whole ſtruc-ture falls to the ground. And withall, the *Prop.* 47. *El.* 1 doth ſtill ſtand faſt (which he tells us, *page* 59, 61, 78. muſt have Fallen, if his Demonſtrations had ſtood :) And ſo, *Geometry* and *Arthemetick* do ſtill agree, which (he tells us, *page* 78: *line* 10.) had otherwiſe been at odds.

And this (though much more might have been ſaid,) is as much as need to be ſaid againſt that Piece.